

[ 377 ]  
And the other terms

$$\text{arc } 7. \frac{41}{5} \cdot \frac{239}{29} \cdot \frac{1393}{169} \cdot \frac{985}{985} \text{ \&c.}$$

To find  $\frac{b}{c}$  such as makes  $bb - 1 = acc$ , i. e.  $acc + 1 = bb$ , recourse must be had to Lord Brouncker's method in Dr. Wallis's *Commercium Epistolicum*.

LVII. *Observations upon the Electricity of the Air, made at the Chateau de Maintenon, during the Months of June, July, and October, 1753; being Part of a Letter from the Abbé Mazeas, F.R.S. to the Rev. Stephen Hales, D. D. F. R. S. Translated from the French by James Parsons, M. D. F. R. S.*

S I R,

Read Dec. 20, 1753. **B**EING assured, that the electricity of the atmosphere would yet afford means of entertaining you, I spent part of this summer in observing what nature presented me upon so important a subject.

On the 14<sup>th</sup> of June I accompanied the Marechal de Noailles to his castle of Maintenon. At my arrival, I set up an apparatus, which consisted of an iron wire 370 feet long, raised to 90 feet above the horizon. It came down from a very high room in the castle, where it was fastened to a filken cord six

B b b                      feet.

feet long, and was carried from thence to the steeple of the town; where it was likewise fasten'd to another filken cord of eight feet long, and shelter'd from rain: and a large key was suspended by the end of this wire, in order to receive the electrical fluid.

*Observation 1.*

From the 17th of June, the time of beginning my experiments, the electricity of the air was sensibly felt every day, from sun-rise, to 7 or 8 in the evening; except in moist weather, when I could perceive no signs of electricity. In dry weather, the wire attracted minute bodies, at no greater distance than three or four lines. I repeated the experiment carefully every day, and constantly observed, that, in weather void of storms, the electricity of a piece of sealing-wax of two inches long was above twice as strong as that of the air. This observation inclines me to conclude, that, in weather of equal dryness, the electricity of the air is always equal.

*Obs. 2.*

When I grasped the wire closely in my hand, the electricity ceased instantly, and did not recover till three or four minutes after: whereas, during a storm, we could deprive the wire of its electricity but a moment; for it immediately return'd with the same vigour. Whence it appears, that the common electricity of the air has but a slow motion.

*Obs. 3.*

I endeavoured to increase the electricity of my wire, by the addition of a second, which communicated  
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with an electrical magazine, composed of pieces of iron, tin plates, gilt paper, and such-like, sustained by filken cords; and I observed, 1. That the electrical fluid did not even then act with any more strength upon minute bodies presented to the wire. 2. That, in depriving this magazine of its electricity, it seem'd to return the more slowly, the more considerable the magazine was; whereas the contrary happens during a storm. This slowness, with which the common electricity of the air is propagated, makes me despair of finding means capable of rendering its motion sensible.

*Obs.* 4.

It does not appear to me, that hurricanes and tempests increase the electricity of the air, when they are not accompanied with thunder: for, during three days of a very violent continual wind in the month of July, we were obliged to put the dust within four or five lines of the conductor, before any sensible attraction could be perceived. The direction of the winds, whether east, west, north, or south, does not make any sensible alteration in the electricity of the air, except when they are moist. In the most dry nights of this summer, I could observe no signs of electricity in the air; but it returned in the morning, as I have said, when the sun began to appear above the horizon, and vanished again in the evening, about half an hour after sun-set. The strongest common electricity of the atmosphere, during this summer, was perceived in the month of July, on a very dry day, the heavens being very clear, and the sun extremely hot. The distance of ten or twelve lines

was then sufficient for the approach of the dust to the conductor, in order to see the particles rise in a vertical direction, like the filings of iron on the application of a magnet.

*Obs. 5.*

On the 27th of June, at 2 afternoon, I perceived some stormy clouds rising above the horizon, and immediately went up to my apparatus; and having applied the dust to the key, it was attracted with a force, which increased in proportion as the clouds reached the zenith. When they had come nearly over the wire, the dust was so impetuously repell'd, as to be intirely scatter'd from the paper. I drew considerable sparks from it, altho' there was neither thunder nor lightning. These sparks were of a very lively red colour, when I attracted them with my finger: they were white and smaller, when I used a wire hafted in a glass tube: they were bluish, and much extended, when attracted by spirit of wine in a silver spoon.

*Obs. 6.*

I applied a piece of resin to the conductor, but could draw no sparks from it: however, all, who were present, heard a noise like that of hairs when burnt. It was the same with sealing-wax, woollen-cloth, linen, &c. Then I took a quicksilver'd glass, and applied to the clean side a piece of wire of six inches long, whilst the other end was put to the conductor; by which I drew a multitude of small whitish sparks, which soon ceased, but were succeeded by a  
noise

noise, like that which happen'd upon applying the resin to the conductor.

I imagine, that this noise proceeds from the violent efforts made by the electrical fluid, in order to penetrate into the wire. Since that fluid has only a determined space to occupy in it, it is natural to think, that when that space is fill'd, the fluid ought to produce a noise like that, which is heard, when the bottle in the Leyden experiment is greatly charged.

When I applied the end of the wire to the silver'd surface of the glass, whilst the other end touched the conductor, the quicksilver affected me so strongly, that, notwithstanding my being so much accustomed to suffer these electrical shocks, I was not able to bear this.

From hence I conclude, that the best method of increasing the electrical power is to make it fall upon some metalline surface, intimately connected with a surface, that is an electric *per se*. And in order to bring reason and experience together, this is the manner, in which I think the power augmented :

When the electrical fluid is pushed with rapidity along the conductor (as it happens during a thunder-storm), it ought to be instantly diffused over the surface of the quicksilver. This fluid communicating with the glass more easily than with the air (which we shall prove by-and-by), it ought partly to enter into the substance of the glass: for the difficulty, which it finds in passing through its pores, gives it time to accumulate, and consequently to shock bodies applied to it with the greater power. But this method, which seems so convenient to increase the force of  
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the electrical fluid in a storm, never succeeded for the common electricity of the air. I always found it nearly extinct, never exerting itself beyond a certain sphere of action, and that very inconsiderable.

*Obs. 7.*

When the stormy clouds were in the zenith of my wire, I observed, that the electricity was increased to so high a point, that the filken thread attracted light bodies at the distance of seven or eight inches. This cord was six feet long, and in the first foot the electricity was nearly as strong as in the wire, but from thence it diminished in the rest of the length. I substituted a glass tube to the filken cord, and observed the same phenomenon, with this difference, that the electrical fluid penetrated it with greater difficulty.

*Obs. 8.*

The stormy clouds, which I mentioned before, remained about two hours above the horizon, without either thunder or lightning; nor did a very heavy rain diminish the electricity, except about the end, when the clouds began to be dissipated; and for that time I left my apparatus.

About six o' clock in the evening I was told, that there were signs of a new storm in the air: I went up, and while I was preparing matters, a young man of the town, thirty-five years old, subject to an epilepsy, was among the spectators. The small time, which the storm lasted, was not enough to make many trials in; and the following was what I most attended to:

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I drew sparks upon the epileptic person, who was present, from the first thunder-clap. At first he bore them; but in two or three minutes I perceived his countenance change; and, for fear that any accident should happen to him, I begg'd he would retire. He was no sooner returned home, than his senses fail'd him, and he was seized with a most violent fit. His convulsions were taken off with spirit of hartshorn; but his reason did not return in an hour and half. He went up-and-down-stairs, like one who walks in his sleep, without speaking or knowing any person, settling his papers, taking snuff, and offering chairs to all that came in. When he was spoken to, he pronounced inarticulate words, which had no connexion of sense.

When this poor man recovered his reason, he fell into another fit. His friends told me, that he was more affected with this distemper when it thunder'd, than at any other time; and that if at any time it happen'd, which it rarely did, that he then escaped, his eyes, his countenance, and the confusion of his expressions, sufficiently demonstrated the weakness of his reason.

The next day I learned from himself, that the fear of thunder was not the cause of his disease; but that, however, he found a fatal connexion between phenomenon and that distemper, with which Providence was pleased to afflict him. He added, that, when the fit seized him, he perceived a vapour rising in his breast, with so much rapidity, that he lost all his senses, before he could call for help.

Such are the observations, Sir, which my moments of leisure suffer'd me to make: I should have been  
very

very glad, if the matter were more thoroughly examined, and my researches more worthy of being presented to you: but you are better acquainted with nature than any body, and you well know how difficult it is to follow her in her operations. As to the rest, I shall think myself well rewarded for my trouble, if she more frequently gives me the pleasure of amusing you.

I have the honour to be, with a sincere and respectful attachment,

S I R,

Your most humble and

obedient servant,

W. Mazeas.

*END of PART I.*